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भाग 3 क्षैतिज संघटट परीक्षण (क्षैतिज अथवा आनत परीक्षण, पेण्डुलम परीक्षण)

(दूसरा पुनरीक्षण)

Indian Standard

PERFORMANCE TESTS FOR COMPLETE, FILLED TRANSPORT PACKAGES

PART 3 HORIZONTAL IMPACT TESTS (HORIZONTAL OR INCLINED TEST, PENDULUM TEST)

(Second Revision)

ICS 43.060.40

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NEW DELHI 110002

February 2002

Price Group 4

Transport Packages and Packaging Codes Sectional Committee, TED 24

FOREWORD

This Indian Standard (Part 3) (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by Transport Packages and Packaging Codes Sectional Committee had been approved by Transport Engineering Division Council.

This Standard was first published in 1973. The second revision has been undertaken to bring it in line with ISO 2244 : 2000 'Packaging — Complete, filled transport packages and unit loads — Horizontal impact tests'. issued by International Organization for Standardization (ISO).

In this revision the following technical changes have been incorporated:

a) Clauses on References and Terminology have been added, and
b) Figures pertaining to tolerances on the test specimen attitude for an impact on an edge or a corner have been added for clear illustration.

Packages intended for transport of goods are required to fulfill the primary function of physical protection to the contents. The packages are transported normally by road, rail, sea and air, as also inland water-ways either by one or a combination of these modes. The nature of the hazards that are confronted during transport is widely varying depending upon the distribution system, handling methods and skills of staff employed. Performance tests are developed for complete, filled transport packages with a view to enabling one determine in advance as to how a package would fair in a given distribution system.

Packages in all modes of transport are subjected to horizontal impact due to sudden change in velocity of the system. The impact may be between package to package, package to the wall of distribution system or among the contents within the package. The different momentum is imparted to the packages and its contents depending on their bulk density.

The composition of the Committee responsible for the formulation of this standard is given in Annex A.

Indian Standard

PERFORMANCE TESTS FOR COMPLETE, FILLED TRANSPORT PACKAGES

PART 3 HORIZONTAL IMPACT TESTS (HORIZONTAL OR INCLINED TEST, PENDULUM TEST)

(Second Revision)

1 SCOPE

This standard (Part 3) (Second Revision) specifies methods of horizontal impact testing (horizontal or inclined plane test and pendulum test) on a complete, filled transport package or a unit load. The test may be performed either as a single test to investigate the effects of horizontal impact or as part of a sequence of tests designed to measure the ability of a package or a unit load to withstand a distribution system that includes a horizontal impact hazard.

2 REFERENCES

The following standards contain provisions which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
7030 : 1988	Identification of parts for complete, filled transport packages when testing (*first revision*)
7031 : 2001	Method of conditioning for testing of complete, filled transport packages (*second revision*)

3 TERMINOLOGY

For the purpose of this standard, the following term and definition shall apply.

3.1 Test Specimen

A complete, filled transport package or unit load.

4 PRINCIPLE

4.1 Applying a horizontal velocity to the test specimen and bringing it to a halt by impact with a vertical impact surface. The atmospheric conditions, the impact velocity and the attitude of the test specimen are predetermined. Particular conditions of impact may be simulated by placing appropriately profiled inserts between the impact surface and the impacting face or edge of the test specimen.

5 APPARATUS

5.1 Impact surface—which should be either:

a) a plane inclined to the vertical at 10° ± 1° (for the inclined plane test), or
b) a plane vertical to within 1° (for the horizontal or pendulum test).

5.1.1 The dimensions of the impact surface shall be greater than those of the impacting face, or selected part, of the test specimen.

5.1.2 The impact surface shall be sufficiently rigid not to deflect more than 0.25 mm when a load of 160 kg is applied anywhere on the surface.

5.1.3 In addition, the apparatus shall meet the requirements and tolerances specified in 7.

5.2 Optional Interposed Hazards

They are to be used when it is required to concentrate the impact in a particular area of the test specimen. The dimensions, material and location of the interposed hazard shall be carefully specified.

Example

A steel beam with a length of 200 mm and a cross-section of (100 ± 1) mm × (100 ± 1) mm with rounded edges of radius (5 ± 0.5) mm, placed centrally to the impact surface (**5.1**).

5.3 Impact Apparatus

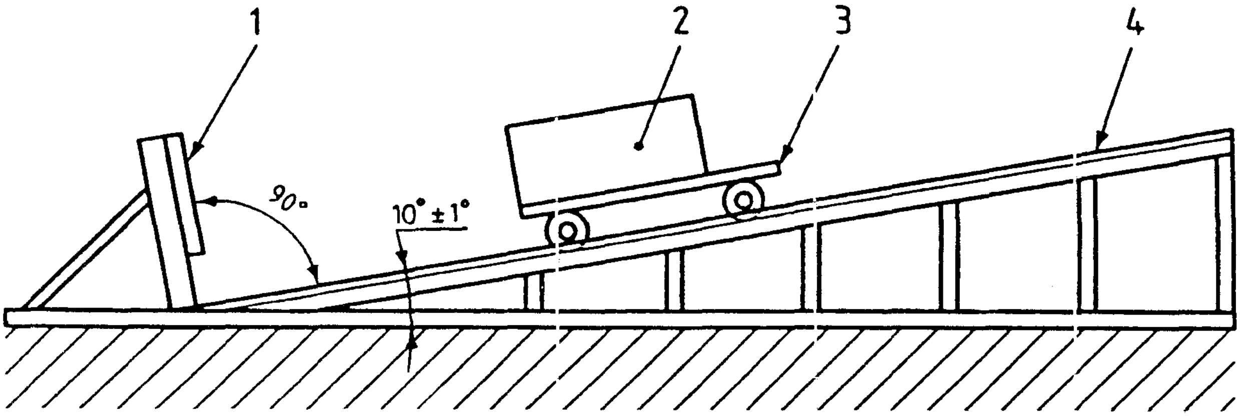
Types which may be used are described in **5.3.1**, **5.3.2** and **5.3.3**.

5.3.1 *Inclined Plane Tester* — consist of the following items.

5.3.1.1 *Two-rail steel track* — inclined at 10° to the horizontal.

The distance along the incline shall be graduated at intervals of 50 mm (*see* Fig. 1).

5.3.1.2 *Rolling carriage* — The surface friction between the rolling carriage/dolly and the test specimen shall be such that during movement from



Key

1 Impact surface (or bumber)
2 Test package
3 Rolling carriage
4 Two-rail steel track

NOTES:

1 The track and the wheels should be kept clean.

2 The wheel bearings should be regularly lubricated. Roller bearings are recommended.

3 A suitable impact surface comprises a number of heavy timbers mounted horizontally accross the face of the structure such as the optional interposed hazard (5.2) can be fitted easily when required.

4 It is recommended that the impact surface (or bumber) be made in such a way that carriage can travel underneath it for about 100 mm so that the test specimen impacts that bumber before the carriage stops.

5 The apparatus should preferably be equipped with a device to prevent the carriage from rebounding after the impact. Either a spring damper or an an oil damper may be incorporated into such a device.

FIG. 1 INCLINED PLANE TESTER

rest to impact the test specimen will not move in relation to the carriage, but such that upon impact the test specimen will move freely.

5.3.1.3 *Impact surface (or bumper)* — Meeting the specification of **5.1**, placed at the bottom of the track with its face perpendicular to the direction of movement of the carriage down the track.

5.3.2 *Horizontal Plane Tester* — consist of the following items.

5.3.2.1 *Two-rail steel track* — fixed in the horizontal plane.

5.3.2.2 *Rolling carriage* — It can be mechanically driven in such a manner that its velocity is known at the moment of the impact. The surface friction between the rolling carriage/dolly and the test specimen shall be such that during movement from rest to impact the test specimen will not move in relation to the carriage, but such that upon impact the test specimen will move freely.

5.3.2.3 *Impact surface or bumper*

It is at one end of the track. The impact surface shall have its face perpendicular to within 1° to the direction of movement of the carriage along the track.

5.3.3 *Pendulum Apparatus*

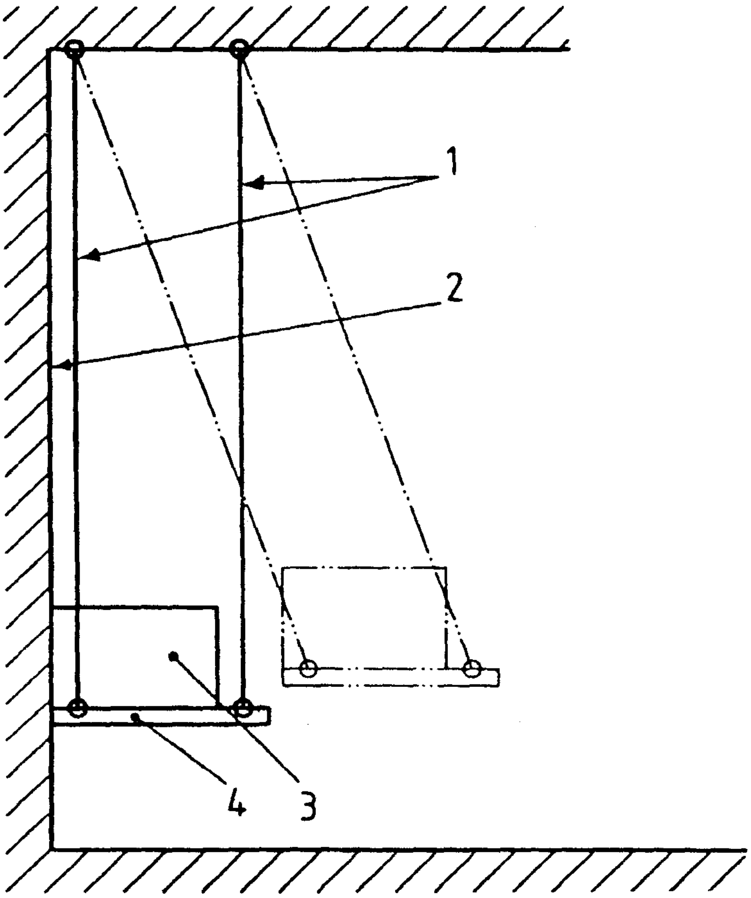
Consist of a rectangular platform suspended at each corner by steel rods or ropes so that in its rest position the front edge just touches the impact surface that meets the specifications of **5.1**. The suspension system shall be such that it moves freely and its path is not obstructed when the test specimen is mounted on the platform (*see* Fig. 2).

5.4 Impact Measuring Apparatus

When required, this shall be fitted on the carriage, allowing measuring and recording of the peak deceleration and impact velocity.

6 TEST SPECIMEN PREPARATION

6.1 Fill the test specimen with its intended contents and ensure that it is closed normally, as if ready for distribution.



Key

1 Steel rods or ropes
2 Impact surface
3 Test package
4 Rectangular platform

NOTE — For certain types of test specimen, such as 'carboys', it may be sufficient to suspend the test specimen from a single rod or rope. In both instances the suspension system shall not impart a rotary movement to the test specimen.

FIG. 2 PENDULUM APPARATUS

NOTE — Simulated or substituted contents may be used, on condition that the dimensions and physical properties of such contents should be as close as possible to those of the intended contents. The closure should still be as for distribution.

6.2 Conditioning

The test specimen shall be conditioned in accordance with one of the conditions described in IS 7031.

7 PROCEDURE

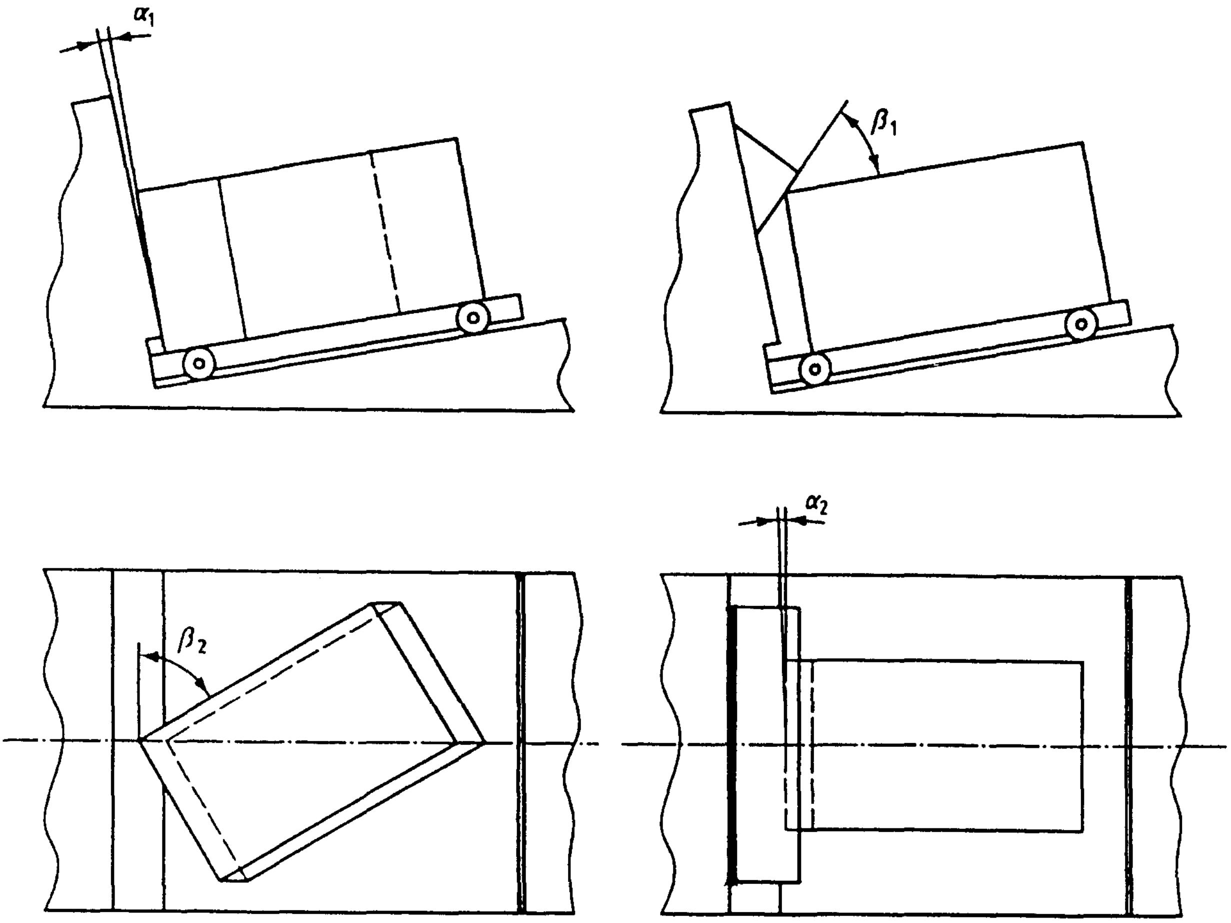
7.1 General

7.1.1 Wherever possible the test shall be carried out in atmospheric conditions identical to those used for conditioning, and particularly where this is critical to the materials or application of the test specimen. In other circumstances, the test shall be carried out in atmospheric conditions which approximate those used for conditioning as closely as is practicable.

7.1.2 The velocity at impact shall be within ± 5 percent of the predetermined impact velocity.

7.1.3 When the impact is on a face, the test specimen shall strike the impact surface so that the angle between the face and the plane of the impact surface is less than 2°.

7.1.4 When the impact is on an edge, the attitude of the test specimen at impact shall be such that the angle between the edge and the plane of the impact surface is less than 2° and such that the angle β between one adjacent face and the impact surface is within ± 5° or 10 percent of the predetermined angle, whichever is the greater (*see* Fig. 3).



$\alpha_1, \alpha_2 : < 2°$
β_1, β_2 ; ± 5° or ±10 percent

a) Impact on a vertical edge

b) Impact on a horizontal edge

NOTE — Shown for the inclined plane test. The same tolerances apply to the horizontal plane and pendulum test.

FIG. 3 TOLERANCES ON THE TEST SPECIMEN ATTITUDE FOR AN IMPACT ON AN EDGE

7.1.5 When the impact is on a corner, the test specimen shall strike the impact surface so that the angle β between any face adjoining the tested corner and the impact surface is within ± 5° or 10 percent of the predetermined angle, whichever is the greater (*see* Fig. 4).

NOTE — Shown for the inclined plane test. The same tolerances apply to the horizontal plane and pendulum tests.

7.2 Inclined Plane Test

7.2.1 Place the test specimen on the carriage in an attitude that will ensure that it strikes the impact surface (**5.3.1.3**) in the desired position (**7.1**).

7.2.2 Whenever possible the test specimen shall not project beyond the edges of the carriage. Raise the carriage to that height, up the incline (**5.3.1.1**), which corresponds with the desired impact velocity, then release it.

7.3 Horizontal Plane Test

7.3.1 Place the test specimen on the carriage (**5.3.2.2**) as described in **7.1**.

7.3.2 Set the carriage in motion along the steel track at a velocity predetermined to give the desired impact velocity on the impact surface (**5.3.2.3**).

7.4 Pendulum Test

7.4.1 Place the test specimen on the rectangular platform (**5.3.3**) as described in **7.1** so that the impacting face or edge just touches the impact surface.

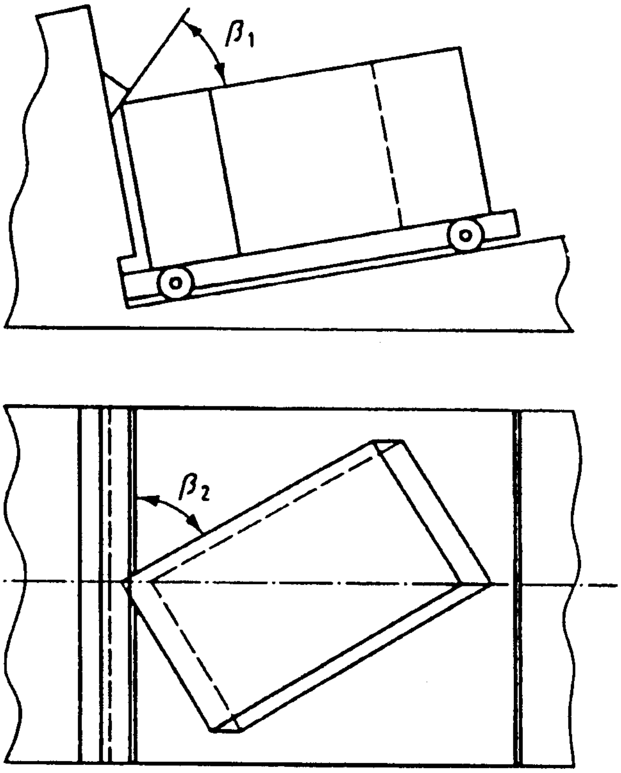
7.4.2 Raise the pendulum by pulling out the platform to the distance from the impact surface appropriate to the velocity required, then release it.

8 TEST REPORT

The test report shall include:

a) a reference to this standard;

b) name and address of testing laboratory and the name and address of customer;
c) unique identification of the report;
d) date of receipt of the test specimens and the date(s) of performance of the test;
e) name, title and signature of persons accepting test responsibility for the test report;
f) statement to the effect that the results relate only to the specimens tested;
g) a statement that the report shall not be reproduced except in full without the written approval of the testing laboratory;
h) the number of replicate test specimens tested;
j) a full description, including dimensions, structural and material specifications of the test specimen and its fittings, cushioning, blocking, closure and reinforcing arrangements, gross mass of the test specimen and mass of the contents in kilograms; and
k) a description of the contents and if simulated or substituted contents were used, full details shall be given;
m) relative humidity, the temperature and time of conditioning the temperature and relative humidity of the test area at the time of test and whether these values comply with the requirements of IS 7031.
n) velocity at impact and if required, the peak declaration.
p) attitudes in which the test specimen was tested, using the method of identification; given in IS 7030;
q) position and description of any interposed hazard if used;
r) type of apparatus used;
s) any deviation from the test method described in this standard;
t) a record of the result, including any observations which assist in the correct interpretation of the results.



β_1, β_2 : ± 5° or ± 10 percent

NOTE — Shown for the inclined plane test. The same tolerances apply to the horizontal plane and pendulum test.

FIG. 4 TOLERANCES ON THE TEST SPECIMEN ATTITUDE FOR AN IMPACT ON A CORNER

ANNEX A

(*Foreword*)

COMMITTEE COMPOSITION

Transport Packages and Packaging Codes Sectional Committee, TED 24

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Indian Institute of Packaging, Mumbai	Shri P. V. Narayanan (***Chairman***)
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Shri P. K. Sharma
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This Indian Standard has been developed from Doc : No. TED 24 (324).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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Printed at Prabhat Offset Press, New Delhi-2